regard to the Commission's rules or to whether their assumptions reflect a network capable of providing the necessary services.[92]

c) Verizon VA's Assumptions About The Deployment Of GR-303 Satisfy (And Exceed) The Requirements of TELRIC.

Notwithstanding that GR-303 cannot be used for unbundling stand-alone loops, it may impact switch costs due to line concentration potential.[93] Verizon VA assumed that 10% of all lines would be served using GR-303 IDLC. This assumption reflects a projected level of GR-303 penetration that might have been achieved during the study period under the GR-303 deployment guidelines in place when Verizon VA originally designed the cost studies filed in these proceedings.[94] In fact, however, Verizon VA has *no* GR-303 in its network today (VZ-VA Ex. 107 at 91), and a 10% penetration is a far greater level than is likely ever to exist in the network given Verizon VA's current GR-303 deployment guidelines. (Tr. at 4087, 4154, 4156-57.) As noted above, packet switching technologies will likely replace circuit switching

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92/ It should be noted that Verizon VA's loop costs *do* give the CLECs a cost benefit that reflects the use of IDLC in the network, even though no stand-alone loops are provisioned on IDLC. Verizon VA's loop costs are based on the aggregate costs of copper, UDLC, and IDLC, thus providing CLECs with the benefit of the lower costs of IDLC where it can be deployed efficiently.

93// Because GR-303 IDLC cannot be used as a substitute for UDLC in a forward-looking network, assuming GR-303 in the network has only a negligible impact on loop costs. It is primarily relevant to switching costs because the GR-303 concentration feature reduces the number of switch interfaces needed to provide service to a given number of switched access lines. (Tr. at 4067-68, 4159.) Nonetheless, Petitioners tend to raise the concentration issue in the context of loop costs, together with their insistence on the possibilities of GR-303 unbundling.

94/ Mr. Gansert explained that, when Verizon originally designed its cost studies, its guidelines recommended deployment of GR-303 in new growth situations and might have produced as much as a 10% deployment over a three-year period. Since then, Verizon's guidelines have changed and no longer call for any deployment of GR-303. (Tr. at 4156.)

technologies in the foreseeable future, leaving little incentive for significant investment in GR-303 by DLC suppliers, and "no rational reason for [Verizon VA to] deploy a significant amount of GR303 in the future." (Tr. at 4087 (Gansert).) While Petitioners asserted that Verizon VA should have used a significantly larger amount of GR-303 in its network, Mr. Gansert explained that, in fact, were the company to redo the cost studies today, *no* GR-303 would be assumed because the company has no plans to deploy GR-303 and believes it is no longer the efficient, forward-looking technology choice. (Tr. at 4156.)

3. The Investment Data Used by Verizon VA Is Reliable and Forward-Looking.

Verizon VA's loop cost studies use Verizon's recently experienced investments (including Virginia-specific values for critical inputs such as placement of cables and conduit systems) with appropriate forward-looking adjustments. Where appropriate, Verizon VA averaged its actual investment data over several years to smooth out annual variations in the cost of installing facilities and to more accurately reflect network-wide, forward-looking investment. (VZ-VA Ex. 107 at 117-18; VZ-VA Ex.122 at 85-104.)

Although AT&T/WorldCom attempt to poke holes in some of the investment data provided by Verizon VA, they provide no evidence that any other figures might be more accurate. Notably, while AT&T and WorldCom have extensive networks both inside and outside of Virginia and offer both local and long distance services using cable, poles, conduit, and the like, neither Petitioner has provided any of its own data to demonstrate that Verizon VA's investment costs are allegedly high. In the absence of any affirmative evidence by Petitioners in support of other investment data, the only reasonable option before the Commission is to rely on the data provided by Verizon VA. Verizon VA's data also is far more relevant, reliable, and verifiable than the inputs that AT&T/WorldCom used in the MSM, which represent an unverifiable mix of nationwide values, data from different vintages that has not been properly adjusted, and unrealistic assumptions about efficiencies that could be achieved in a forward-looking network. (VZ-VA Ex. 109 at 79-101.) In fact, Petitioners never show how such inputs are relevant to Verizon's costs in Virginia.

a) Verizon VA's Vintage Retirement Unit Cost Cable Investment Data.

The cable investment inputs in Verizon VA's loop, dark fiber, and IOF studies are drawn from Verizon's actual data concerning cable material and installation costs in the state of Virginia over the three most recent years for which such data was available when the studies were performed. Specifically, Verizon VA drew this data from its Vintage Retirement Unit Cost (VRUC) database for the years 1997-1999 and then made appropriate forward-looking adjustments. (VZ-VA Ex. 107 at 117, 216-17; Tr. at 4263.) Although AT&T/WorldCom questioned whether, in fact, VRUC data was derived from actual outside plant projects (*AT&T/*WCom Ex. 12 at 32), the record is abundantly clear that this is precisely the case. As Mr. Sanford explained, VRUC data is developed from actual cable installation projects in a given year and reflects the aggregate costs of each specific installation job. (VZ-VA Ex. 122 at 86-87.) VRUC data reflects the total material and installation costs for each cable job reported in the relevant year,[95/] broken down by cable type — aerial, buried, and underground — and also for fiber and copper.[96/] (Tr. at 4262.)

[95/] The VRUC cable prices include loadings for the SAI cross-box, distribution terminals, drop wires, and NIDs. (Tr. at 4263-64.)

[96/] Verizon VA's accounting data tracks actual cable investments by cable and structure type, but cannot track those investments by cable size. Thus, to assign the appropriate portion of cable investment to a particular cable *size*, Verizon relied on certain standard assumptions concerning relative cost differences among cable sizes. (VZ-VA Ex. 122 at 91.) These standard

AT&T/WorldCom nonetheless argue that alleged anomalies in the VRUC data cast doubt on its reliability. (VZ-VA Ex. 122 at 91.) But their arguments simply demonstrate a basic misunderstanding of the VRUC data. For example, they suggest that the Commission ignore the 1998 VRUC data because it reflects per-unit cable investments that are, for underground copper cable, more than 40% higher than the 1997 investments, and that the 1998 data accordingly is the product of "excessive and unsupported inflation" that "produce overstated average installed costs." (AT&T/WCom Ex. 12 at 33.) But the differences in VRUC data year-to-year are not the result of inflation adjustments at all. The variability reflects the fact that the total installed cost of a given year's cable placement projects may be higher than in the previous year because the jobs performed in the later year were more complex or time-consuming, or were performed under more adverse weather conditions, thus resulting in significantly increased installation costs. (VZ-VA Ex. 122 at 89.) Another basis for the year-to-year variability in the VRUC data is the time lag between when cable is installed and booked under the Commission's accounting rules, so that cable that is installed in year one may not be reflected on Verizon VA's accounts until year two. (VZ-VA Ex. 122 at 88-89; Tr. at 4264-65.) Thus, as Mr. Sanford explained, "[t]here is no more reason to believe that the 1998 VRUC prices are artificially high than there is to believe that the 1997 VRUC prices are artificially low." (VZ-VA Ex. 122 at 93.)

In any event, to address the year-to-year variability and smooth out cost variations between cable sizes, Verizon VA performed a linear regression of average installed cable prices

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assumptions lead to patterns among the different VRUC cable prices. AT&T/WorldCom's analysis of these patterns in an effort to undermine the reliability of the VRUC data, however, misses the central point. In the aggregate, VRUC prices reflect the booked investment for each cable type. (Tr. at 4266.) Because the VRUC prices are averaged first through Verizon VA's linear regression analysis, and then through the process of calculating average loop investment across the entire network, there is no reason to believe that the patterns in the VRUC data produce any distortion in UNE loop rates.

across all three years that it included in its studies in order to produce a linear relationship of average installed investment across different cable sizes. (Tr. at 4266.) AT&T/WorldCom's proposal to perform that analysis without the 1998 data makes no sense whatsoever and would produce a substantial understatement of forward-looking costs. There simply is no basis in the record to conclude that any part of the VRUC data reflects anything other than actual investment levels experienced by Verizon VA, nor is there a better source of data for estimating Virginia-specific, forward-looking cable investment.

b) Verizon VA's Conduit and Pole Investment Inputs

To determine forward-looking conduit and pole investments, Verizon VA calculated its average per-unit installed investment (adjusted to 2001 dollars) for the period 1996-2000.[97] As with cable investment data, conduit investment per duct-foot can vary significantly from year-to-year depending on the complexity of installation projects in a given year. For example, projects in urban areas typically involve greater restoration costs, as do projects in rocky terrain and projects requiring a greater number of manholes. (VZ-VA Ex. 122 at 101-02.) The average conduit investment per duct foot in any given year will vary depending on the particular mix of installation projects in that year, and thus a single year is likely not a sound basis for estimating a

[97] Verizon VA began with its total conduit investment for the years 1996 through 2000. These investments were then adjusted to 2001 levels using Verizon VA-specific telephone plant indices and summed to produce a total, inflation-adjusted investment for the five-year period. The total, inflation-adjusted investment was then divided by the total duct-feet installed during that period to produce an average investment per duct-foot in 2001 dollars. (*See* VZ-VA Ex. 211, Worksheet 3.1 in VA Unbundled Loop Rev 011030/Common Input/3.1 Conduit Investment Unit Price .xls on CD #1.) Verizon used a similar approach for calculating average investment per pole in 2001 dollars. (*See* VZ-VA Ex. 211, Worksheet 2.1 in VA Unbundled Loop Rev 011030/Common Inputs/2.1 Pole Investments.xls on CD#1 (Nov. 1, 2001).)

network-wide average. Accordingly, Verizon VA used its average conduit investments across multiple years in order to obtain a representative average cost of installing conduit.

Petitioners' proposal to use only the least expensive year of Verizon VA's conduit investments, though for purportedly different reasons than their proposal to use only the least expensive year of VRUC cable prices, relies on the same refusal to acknowledge the underlying reasons for variation in installed investments from year-to-year. AT&T/WorldCom contend that Verizon VA's conduit investment data demonstrate "economies of scale" that produce lower costs per duct foot of installing conduit as the amount of conduit increases. (AT&T/WCom Ex. 12 at 40-41.) But AT&T/WorldCom's argument confuses correlation with causation.[98/] As Verizon VA's witnesses have explained, a variety of factors contribute to varying per-foot costs of installing conduit in a given year, none of which relate to the total amount of conduit installed in that year. Rather, as explained above, a year in which less conduit was installed might have been a year in which the conduit installation jobs were labor-intensive; a year in which more miles were installed might have fortuitously involved easier jobs. But the reverse might just as well have been true.

With respect to pole investments, AT&T/WorldCom do not even pretend to analyze Verizon VA's actual data.[99/] Rather than quibble with the accuracy or treatment of Verizon

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98/ Indeed, even the very correlation that AT&T/WorldCom cite in support of their argument is questionable at best. For example, AT&T/WorldCom's own testimony shows that Verizon VA installed approximately 26% *more* conduit in 1999 than in 2000, yet Verizon VA's 1999 costs per duct-foot were higher than its costs per duct-foot in 2001 dollars. (*See* AT&T/WCom Ex. 12 at 41.)

99/ Though pole investments do not typically show the same variability from year-to-year, Verizon used average pole investments during the same five-year period to determine forward-looking per-pole investments. Use of this average investment per pole actually produced a lower forward-looking investment ($1,006.62) than the data from the most recent of the five years

VA's pole expenses, AT&T/WorldCom simply disregard that data altogether, insisting that Verizon VA's pole investment data fail to reflect the "economies of scale" that Petitioners insist would characterize the construction of the imaginary, forward-looking network to be considered for TELRIC purposes. According to AT&T/WorldCom, Verizon VA's costs reflect the supposedly inefficient costs that attend "limited pole installations reflected in Verizon's historical data." (AT&T/WCom Ex. 12 at 42.) The alternative costs they propose are nearly 55% lower than even Verizon VA's *lowest* average per-pole investment for any of the years from 1996 through 2000.[100/]

AT&T/WorldCom's argument, however, defies common sense and Verizon VA's own experience. Though it may be true that, in principle, "a planned job that is staged and planned as part of a normal engineering process is usually going to be less costly than an emergency job," it is equally true "that the circumstances vary from job to job." (Tr. at 4095 (Gansert).) Moreover, the economies of installing poles all at one time diminish markedly if the pole installation job grows to a certain size. If the entire network worth of poles were being placed, as Petitioners necessarily assume, the huge material and overtime costs clearly would dwarf any savings. As Dr. Tardiff explained, "[w]hatever economies of scale you want to assume should not be false economies of scale, coming about from assuming you get certain efficiencies . . . [from] planting your poles all at one time, ignoring the fact that that really can't be done in the real world." (Tr. at 4100-01.) Verizon's own experience bears this out, as Mr. Gansert explained further:

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would have produced ($1,097.42.) (*See* VZ-VA Ex. 211, Worksheet 2.1 in VA Unbundled Loop Rev 011030/Common Inputs/2.1 Pole Investments.xls on CD#1 (Nov. 1, 2001).)

[100/] The year 1997 happened to produce Verizon VA's lowest average, per-pole investment during this period. The average per-pole investment for that year, adjusted to 2001 dollars, was **[BEGIN VERIZON PROPRIETARY] [END VERIZON PROPRIETARY]**.

> [W]e had sort of a sad lesson about that because. . . . a few years back we had a tremendous ice storm in the Northeast. . . . [E]very Verizon worker that knew how to put a pole up was putting up every pole we could buy in North America. And believe me, those poles did not come cheap, and they were put up quite sequentially.

(Tr. at 4094.)

c) Verizon VA's Cable and Structure Investment Data Reflect Achievable Structure Sharing Opportunities.

Verizon VA's cable and structure investment data reflect the opportunities the company has enjoyed in the past to share structure costs with cable television operators and electric utilities, which likely produce an overly generous prediction of structure sharing opportunities in the future.[101/] Verizon VA's buried cable and conduit investments include only the trenching costs that Verizon VA actually has incurred and thus intrinsically reflect any sharing of trenching costs with third parties. (VZ-VA Ex. 122 at 146; Tr. at 4380.) Additionally, where a third party leases an already-installed duct from Verizon VA, that duct is treated as occupied for purposes of calculating Verizon VA's conduit utilization factor. As a result, the investment associated with that duct is not recovered from Petitioners through Verizon VA's investment per duct foot input in these proceedings.

AT&T/WorldCom argue that Verizon VA's investment figures should be revised to reflect a significant increase in sharing opportunities — reducing investments by up to 75% — for the forward-looking network. However, Petitioners present no evidence to support this assumption. When asked, neither Petitioner was willing to say anything about its own structure sharing experiences except that it had not shared trenches with Verizon in the past. (*See* VZ-VA

101/ For aerial cable, Verizon VA accounted for shared pole investment through the use of a pole sharing factor. AT&T/WorldCom do not challenge Verizon VA's pole sharing factor. (Tr. at 4377-78.)

Ex. 122 at 146-47.) In fact, when asked by Staff whether Petitioners had enjoyed the type of structure sharing opportunities that they propose and that AT&T/WorldCom witness Mr. Riolo described, Mr. Riolo was forced to admit that he simply had no idea. (Tr. at 4547.)

Despite Mr. Riolo's rather wild speculations about sharing — he suggests, for example, that in some cases "20 to 30 people"[102] are available to share trenching costs (Tr. at 4384-85) — Ms. Murray conceded at the hearing that the only relevant analysis is the determination of "the manner in which structure sharing opportunities will *actually* be available to companies such as Verizon." (Tr. at 3218 (emphasis added).) In response to Staff questions, Ms. Murray further agreed that it would make sense to look at the sharing that the incumbent is experiencing today. (Tr. at 3218-19.) Yet, if that is the analysis, Verizon VA's cable and structure investments should not be adjusted to reflect additional structure sharing at all, as they already reflect the limited structure sharing that Verizon VA has been able to achieve to date. As Mr. Gansert explained, structure sharing has been rare because, in most cases, entities can simply lease Verizon VA's conduit after Verizon VA alone has borne all structure installation costs:

> We are postulating that [third parties] would voluntarily and willingly and enthusiastically want to absorb an equal share of the costs from us. There is absolutely no economic motivation for anyone [to share trenches for conduit.] [I]n fact, they would have to be irrational to do that since there [are] extraordinarily reasonable conduit rental rates imposed on us so that we have to make our conduits available to other people. . . . We are going to build the trench, and we are going to pay for it, and they might make a deal with us to put something in there, but they sure as heck are not going to pay on half the cost.

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[102] Apparently, Mr. Riolo believes that among the "20 to 30 people" ready to absorb the significant costs of trenching with Verizon are fire departments, school systems, and municipal agencies, an assertion that strains credulity, given that the budgets of such entities and the below-cost conduit leasing rates imposed on Verizon VA make structure *leasing* a far more plausible option. (Tr. at 4385-86.)

(Tr. at 4387.)

Ms. Murray alternatively suggested that the new entrant's structure sharing opportunities would mirror Verizon's experience with structure sharing in connection with plant placed in new developments. (Tr. at 3219.) But the suggestion that Verizon's experience in new developments is a good proxy for construction and sharing in the forward-looking network is simply absurd. When plant is placed in a new development, there may in fact be a utility that needs to reach the same new neighborhood and is willing to share the trenching costs with Verizon as it lays cable to the area. But the network of the future postulated by Petitioners would logically be built in the real world in which other utilities' networks already are in the ground in all existing neighborhoods; thus, unless AT&T/WorldCom believe that TELRIC wipes the slate clean for all utilities (requiring that Pepco, too rebuild its entire network), the hypothetical new entrant would experience few structure sharing opportunities, except in those circumstances where the utilities do not already have facilities — in other words, the new entrant's structure sharing opportunities would be quite similar to, or even more limited than, Verizon VA's. As Dr. Tardiff explained:

> This discussion indicates that to consider sharing hypothetically almost presupposes the notion that not only do you have a hypothetical new entrant in the phone business, but simultaneous hypothetical entrants in all the other utility businesses as well, so there is a coincidence in time where the sharing is possible. And I think when you take that into account, Dr. Shelanski's argument that you're not going to go much beyond what's already there in the existing network and existing areas makes even more sense.

(Tr. at 3225.) Referring to this charitably as a "philosophical argument," Dr. Tardiff reiterated, "certainly the utilities that are out there in the world today are not going to move over to Verizon's newly constructed routes." (Tr. at 4383.) Ms. Murray ultimately conceded that Petitioners' approach is "a little bit complicated as a conceptual matter," and "that [she hadn't] thought through precisely how one would do that." (Tr. at 3222-23.)

Verizon VA's approach, which reflects *all* trench sharing Verizon VA has experienced over the three years for which data is available — for new developments and existing routes — provides the best measure of the amount of structure sharing that likely would exist going forward.

4. Verizon VA's Utilization Factors Are The Result of Efficient Network Operation, Are Forward-Looking, and Are a Proper Means of Ensuring That Verizon VA's Costs Are Recovered.

a) Verizon VA's Average Network Fill Factors are Forward-Looking.

In designing its cost studies, Verizon VA looked to its experience in operating the network in Virginia to determine the utilization (or "fill") factors expected to characterize each type of plant — that is, the percentage of its facilities that would be actively used in a forward-looking network to provide service to a paying customer, as compared to the total capacity in the network. These fill factors are used in Verizon VA's studies for the sole purpose of ensuring that the rates spread the forward-looking costs across only those units of capacity that will be available to produce revenue. Verizon VA does not use its utilization factors to size facilities in the cost studies or to otherwise plan the network, nor are the fill factors the product of any cable or equipment sizing algorithms in the cost studies. Rather, the fill factors used in Verizon VA's studies reflect the utilization levels that Verizon VA has observed in the Virginia network and expects to observe on a forward-looking basis.[103/] These fill factors reflect the amount of spare capacity that exists across the facilities in Verizon VA's network — amounts that have, on average, remained stable for a number of years, and are expected to remain stable in the future.

[103/] In all but one case, Verizon VA determined that its actual utilization factors represented the best measure of forward-looking utilization. The one exception was RT plug-ins, for which Verizon VA assumed a forward-looking utilization rate that was higher than its actual rate.

Verizon VA therefore can predict with a reasonable degree of certainty the percentage of its network that would be available, on average, to produce revenue in the forward-looking network.

In an efficient local exchange network, there will, by necessity, always be a certain amount of spare capacity. Spare is needed for administrative purposes[104/] and to accommodate demand fluctuations and, in some cases, future growth.[105/] Additional spare also is the inevitable result of demand characteristics, network operation, and design.[106/] As a price-cap regulated company, Verizon VA has had and continues to have incentives to reduce spare in its network where doing so is efficient. However, there are competing concerns: the network must be engineered to meet service quality requirements, including the obligations imposed by the Virginia Commission, and operational demands. (VZ-VA Ex. 122 at 107-14.) The utilization levels in Verizon VA's network reflect Verizon VA's efforts to design and engineer the network in the manner that best balances these considerations. While those efforts may not be perfect, Petitioners' suggestion that the fill levels should be radically higher are implausible. If Verizon

104/ "Administrative spare" is necessary at each point in the network to permit efficient maintenance and administration of the network. (VZ-VA Ex. 107 at 35.)

105/ New capacity must be built in anticipation of demand and without any certainty about what level of demand will materialize. Verizon VA is required to have facilities available in advance of the specific need in order to meet its legal obligations to provide service to customers upon demand. (Tr. at 4112-13; VZ-VA Ex. 107 at 36; VZ-VA Ex. 122 at 113, 109-14.) Installing capacity in advance also reduces construction costs by permitting network growth in efficient capacity increments and at efficient time intervals. (VZ-VA Ex. 107 at 36-37.)

106/ For example, customer churn (*i.e.*, the inward and outward movement of customers) results in service being disconnected for some period of time when a customer moves out of a particular location until a new customer moves in. (VZ-VA Ex. 107 at 36.) The annual rate of churn ranges from 20% to 25% each year, and the duration of vacancies varies widely. (Tr. at 4102; VZ-VA Ex. 107 at 36.) The phenomenon of breakage (*i.e.*, that many network components are available only in discrete capacity sizes) also produces spare capacity. (VZ-VA Ex. 107 at 36.)

VA could operate efficiently at a higher average utilization and still provide continuous, quality service, it would have every incentive to do so. But recent trends in the Virginia market, which witnessed a sudden, unprecedented expansion in a previously quieter business area, and which subsequently has seen many businesses suddenly closing up shop, should drive home both the need for and causes of spare: growth and demand peaks can be unpredictable, and customers may suddenly disappear. The network must be designed to accommodate the former; the latter will leave some lines idle.

There is no reason that Verizon VA's utilization rates would or should increase in the forward-looking network. The forward-looking network simply will include a different mix of the same technology or plant that exists in the current network. Verizon VA has studied the utilization rates of each type of plant — *e.g.*, fiber feeder, copper feeder, distribution cable — and there is no reason to believe that the average utilization rate for any type of plant would change in the forward-looking network, even if the overall plant mix were to change. If anything, the competitive environment assumed under TELRIC should *decrease* average utilization as a result of increased fluctuations in demand and customer churn in the network. (*See* VZ-VA Ex. 107 at 39.)

And AT&T/WorldCom certainly have not produced any evidence that any network — today's or tomorrow's — could be operated efficiently with utilization rates as high as they propose. Even the MSM does not always use fills as high as those Petitioners propose for Verizon VA: Indeed, the MSM's distribution fill factor is only 52.5% — less than the 60% Petitioners insist must be used in Verizon VA's studies. (Tr. at 4514.) When Mr. Riolo was asked by the Commission if he was "aware of any network that achieves [AT&T/WorldCom's proposed] fills," he conceded that, while individual pockets of plant might do so, he could not pretend that he knew of any network in which such fills were achieved on average across the network. (Tr. at 4513-4515.) As Mr. Gansert testified, if an effort *were* made somehow to increase average fill across the network to the levels proposed by Petitioners, the result would be a loss of efficiency and a degradation of service. (Tr. at 4575.)

b) Spare Capacity in the Network Remains Constant on Average and Constitutes a Current Operating Network Cost.

AT&T/WorldCom's various arguments concerning whether Verizon VA has miscalculated or overstated the need for spare capacity in particular facilities are red herrings.[107/] The central attack on Verizon VA's fill factors, however, is Petitioners' claim that, even if Verizon VA's fill factors reflect the proper amount of spare in the network, CLECs should not pay for spare because they are not "using" it today. (AT&T/WCom Ex. 12 at 42-43; AT&T/WCom Ex. 11 at 32-33.) Their argument takes several forms, all turning on the concept that spare in the network is eventually "used up" by future growth and that today's customers should receive a credit for the revenue Verizon VA will receive in the future when current spare capacity is "used up" by future paying customers.

This argument is absurd. First, Petitioners introduced the notion that current ratepayers (or CLECs) pay the full costs of the facilities they use when they receive telephone service or a

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[107/] Petitioners argue, for example, that in calculating fill, Verizon VA should include as utilized cpacity not only "working lines" but connect-through and defective pairs, thus increasing utilization. They argue that this is how Verizon engineers consider utilization in practice when evaluating facilities. (AT&T/WCom Ex. 12 at 43-44.) Of course, at the same time, Petitioners recognize that "the costing exercise here is conceptually distinct from the task of an outside plant engineer." (AT&T/WCom Ex. 12 at 42.) Basic cost recovery principles dictate that Verizon VA can recover its costs only through *revenue generating units*. Because defective or idle (unassigned) units of capacity are obviously not revenue-generating, they should not be considered in the numerator when calculating utilization for cost study purposes. (VZ-VA Ex. 122 at 115-16.)

loop UNE, as well as the full costs of the additional spare that Petitioners contend is waiting to be "used up." Thus, Petitioners argue, if the utilization rate of a hypothetical facility were 50%, the customer who orders one unit on that facility would be paying for two. At some point, they argue, the customer accordingly should be entitled to one free unit of capacity in that facility. (*See, e.g.*, Tr. at 2935-36 ("I already paid for it . . . When do I get my free drop[?]").) In the alternative, Petitioners argue, the current customer's rates should be reduced, because a future customer will one day receive and pay for the facility that Petitioners contend the present customer is paying for today. (Tr. at 2935-36, 2996.)

The first flaw in this argument, and there are several, is that customers *never* pay for the full costs of the facility — or the unit of capacity on the facility — that is used to provide their service, much less the costs of the spare. As Dr. Shelanski explained, customers who obtain service — and CLECs who purchase UNEs — pay only the "incremental costs of " providing that unit of capacity in the facility *during the period that the customer receives service*. (Tr. at 2936.) The notion that after a few years of paying for service or a UNE, a customer or CLEC has paid the full costs of the underlying facility forevermore flies in the face of logic and ratemaking policy.

Furthermore, Petitioners seem to believe, incorrectly, that customers pay for specific facilities — either the one on which they are receiving service or the illusory spare facility for which Petitioners contend that they have paid. As Dr. Tardiff explained, customers and CLECs do not pay for any specific facility or share of a facility. Instead, they pay for a share of *capacity* on a network that is designed to operate efficiently, and which thus has the "spare capacity that allows Verizon to provide service at the least cost." (Tr. at 2937.) Or, as Mr. Gansert testified:

> You're paying for . . . [units] of capacity on the distribution system. You're paying for your share of the investment it takes to

> maintain the distribution investment to your point. You don't buy a pair, and you don't pay a rate that recovers that pair cost. . . . You're paying for an allocated part of the investment in the distribution plan[t] that serves that area. If your pair breaks, we give you another pair. We don't charge you for that pair. If your drop wire falls down, we put it back up. We don't charge you for another one. You are paying for service. You're paying for two loops of service in the infrastructure that's required to provide that—we are allocating two units of capacity. If you don't use it, somebody else will use it.

(Tr. at 4201-02.) Or, put simply, customers — even CLECs — pay for service, such as a functioning loop. The rates customers pay are designed to cover the costs of providing that service, which include building a network with the spare capacity needed to allow it to function properly.

Finally, Petitioners' entire argument rests on their contention that the primary purpose of having spare capacity in the network is to make it efficiently serve future growth. (*See, e.g.,* AT&T/WCom Ex. 12 at 43, 45-46.) But, as Verizon VA has repeatedly explained, spare capacity is needed to serve *current* operational needs, to meet *current* and unpredictable demand spikes, for current administrative purposes, and the like. (*See, e.g.,* VZ-VA Ex. 107 at 35-38.) It thus is needed to serve today's customers — it is not, as Petitioners suggest, paid for by current and then "used" by future customers as a result of growth. (*See, e.g.,* AT&T/WCom Ex. 12 at 43; Tr. at 4192-93, 4204-05.) Spare capacity across the network is *never* "used up;" on average, spare remains and is maintained at the same level. While it is true that, in an individual facility, spare capacity might be "used up" at some point because of future growth, the ongoing process of adding new capacity to the network as particular facilities reach exhaust balances the fact that demand in the network grows — leaving average utilization in the network stable over time. (VZ-VA Ex. 107 at 101.) As Dr. Tardiff explained at the hearing:

> [AT&T/WorldCom's position] seemed to be that this capacity that you put in at the beginning . . . somehow gets used up over time. . . . The fact of running a network is that you don't see that, that capacity is not being used up. The spare capacity you put in today, . . . [i]f you look next year, you see the same amount. That's an efficient level. That is, in every period you see that in order to efficiently run the network, you have that much spare capacity for whatever reason. It could be for extra customers, it could be for administrative reasons, it could be . . the fact that customers come and go.

(Tr. at 2991-92.) Thus, spare capacity does not get "used up," and tomorrow's customers do not get a network consisting solely of today's spare capacity. In tomorrow's network, there should be the same average amount of spare, and thus the ratepayers of tomorrow, like the ratepayers of today, should shoulder the cost of carrying that efficient level of spare capacity during the time they receive service. (VZ-VA Ex. 122 at 106; VZ-VA Ex. 110 at 12-14.)

c) Each of the Facility-Specific Average Utilization Factors in Verizon VA's Studies is Accurate and Efficient.

As noted above, Verizon VA's expected fill factors generally are the product of the fills that Verizon VA has experienced running a real-world network. Different factors, such as breakage, churn, demand, and growth, drive the utilization of various facilities to various degrees. But in all cases, Verizon VA's utilization rates are the product of efficient engineering and balance the desire to maximize the use of plant with the competing goal of providing timely, high-quality service at a reasonable cost. Petitioners quibble with the utilization rates reported by Verizon VA, for every type of facility, suggesting incessantly that the utilization rates should be higher. In each case, AT&T/WorldCom steadfastly refuse to acknowledge that spare is needed for purposes other than accommodating growth or that breakage and churn impact levels of spare. But none of their arguments are supported by fact. Petitioners could not demonstrate that any real network could operate in the manner they prescribe, and in no case did they explain just how Verizon VA should or could adapt its engineering practices to achieve the proposed higher utilization levels without service degradation.

Petitioners focus in particular on Verizon VA's average **[VERIZON VA PROPRIETARY BEGIN]** **[VERIZON VA PROPRIETARY END]** fill for distribution, insisting that it should be 60%. Yet, as noted above, even the MSM distribution fill is not 60%, but 52.5%, suggesting that even Petitioners could not create a network with a 60% distribution fill. The value reported by Verizon VA reflects the reasonable amount of spare capacity necessary to serve Virginia demand efficiently while meeting the service quality standards imposed on Verizon VA. The primary factor in distribution utilization is not growth, but the need to accommodate subscribers' needs for multiple lines in a timely manner. (VZ-VA Ex. 122 at 114.) This is difficult because demand is unpredictable: the number of houses in a development may be fixed, but the number of lines that the residents of those houses will want at any given time is not predictable. (*See, e.g.*, Tr. at 4112-13.) As Mr. Gansert explained, in order to meet its regulatory obligations in Virginia, Verizon VA must build distribution facilities so that they are positioned in advance to serve potential demand that may develop in each living or business unit at any point in time; this concept of "ultimate demand" thus does not relate to pre-building for growth, but to building sufficient capacity to serve the varying potential demand at each customer location in a given area. (Tr. at 4116-17.)

Verizon VA follows the efficient practice of building distribution facilities with at least two pairs of distribution cables per subscriber "to avoid the prohibitive cost and delay associated with installing a new cable each time a group of subscribers on a particular street orders an above-average number of additional lines." (VZ-VA Ex. 107 at 115.) As Mr. Gansert explained, this practice "has been used in the entire LEC industry for almost 30 years and was based upon experience and studies that have been done over those years to determine the most efficient way to build" the distribution plant. (Tr. at 4203.) Verizon VA's average distribution utilization rates are due in large part[108/] to the difference between the efficient construction of two or more distribution pairs per subscriber and the actual average utilization in Virginia of 1.18 pairs per subscriber. (VZ-VA Ex. 107 at 115.) In addition, a variety of other factors specific to Verizon VA's provision of service to Virginia customers, (such as the need to satisfy service quality standards in Virginia and the effects of Virginia customer churn, contribute to Verizon VA's average distribution utilization rate. (VZ-VA Ex. 122 at 118-23.) As the Commission has recognized, fill factors prescribed for cost proceedings should account for such state-specific considerations.[109/]

AT&T/WorldCom have offered no evidence demonstrating that Verizon VA's existing distribution plant contains inefficient or unreasonable levels of spare capacity. Their only apparent attempt to do so consists of the naked, unsupported assertion that, "[u]nder scorched-node, for those areas where demand for additional lines has remained stable and is likely to remain so going forward, fewer spare facilities can be provisioned, resulting in more efficient use and higher utilization levels." (AT&T/WCom Ex. 12 at 47.) Apparently, Petitioners believe that the new, scorched node network could look at past demand served by the incumbent and be designed more tightly so as to serve just that amount of demand in just the locations where it exists today. The problem, of course, is that such a tightly designed new network could be defunct in a day, because past demand is a poor predictor of tomorrow's need at specific

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108/ Verizon VA also adjusted its utilization rate for distribution by 10% to account for breakage. (VZ-VA Ex. 107 at 112-13.)

109/ *Massachusetts § 271 Order* at 9007 ¶ 39.

customer locations. There is no basis for assuming, for example, that the neighborhood in which customers have rarely ordered two lines will not suddenly sprout teenagers needing second lines for surfing the Internet.

Petitioners' critique of Verizon VA's **[VERIZON PROPRIETARY BEGIN] [VERIZON PROPRIETARY END]** utilization factor for fiber strand is equally without merit. Fiber strand utilization is driven primarily by breakage and the need for spare ribbons to perform rearrangements and maintenance. Most fiber cables are manufactured with the individual fiber strands sealed in groups of 12, called "ribbons." Because it is so much easier to work with whole ribbons than individual strands, it is more cost-effective to allocate and dedicate fiber by ribbon, even if this produces significant spare strand due to breakage. Thus, while a remote terminal may require only four strands, it is more efficient to dedicate the full ribbon and leave eight spare strands than to divide the ribbon into individual strands and resplice them individually to use at other sites. (VZ-VA Ex. 107 at 109.) In addition to breakage, fiber strand utilization is driven by the need to have spare fiber ribbons available for use when an individual ribbon fails in order to avoid service outages. (VZ-VA Ex. 122 at 131.)

AT&T/WorldCom's proposed fiber utilization factor of 100% fails to account for either of these primary drivers. In effect, AT&T/WorldCom assume "that you could build a perfectly sized and allocated fiber network in which every fiber was used . . . [with] no capability to ever provide any other service to any other person who wanted service." (Tr. at 4501-02 (Gansert).) In Mr. Gansert's words, this "just patently defies common sense." (Tr. at 4502.) Neither argument Petitioners mount to defend their position has any merit whatsoever. AT&T/WorldCom contend that both DSL and dark fiber services will consume the strands that Verizon VA has labeled "spare." (AT&T/WCom Ex. 12 at 52.) But this is simply not the case

— and even if either service drove utilization up, *neither* could have anywhere near a great enough impact to drive fiber strand utilization to 100%. Standard DSL is a copper-based technology that would have no impact on fiber strand utilization, and Verizon VA has no plans to offer fiber-based DSL services. (VZ-VA Ex. 122 at 132.) And Petitioners have offered nothing but speculation that they or other CLECs will increase their demand for dark fiber sufficiently to affect fiber strand utilization. (VZ-VA Ex. 122 at 133.)

Finally, Petitioners criticize Verizon VA's **[VERIZON PROPRIETARY BEGIN]**

[VERIZON PROPRIETARY END] utilization factor for underground ducts. Given the relatively low incremental cost of installing an additional duct during the initial installation of a conduit section, the high cost of installing additional ducts at a later date, and the fact that municipalities typically discourage repeated excavations, "it is far more efficient and appropriate to install sufficient duct capacity at that time to accommodate the growth needs for the life of the plant than it is to repeatedly re-dig trenches every few years to install additional duct capacity." (VZ-VA Ex. 122 at 141-42.) Other factors, such as the need for spare ducts in case of a duct failure or flood, also counsel in favor of maintaining a sufficient amount of spare duct capacity. (VZ-VA Ex. 122 at 142.)

AT&T/WorldCom's criticisms of Verizon VA's duct utilization factor miss the point entirely. They attempt to minimize current costs by insisting that only one spare duct per conduit section should be installed, notwithstanding the fact, noted above, that the costs of installing additional ducts are minimal. Petitioners argue that spare ducts are unnecessary because Verizon VA has spare *cable*, or can increase fiber capacity if necessary by upgrading fiber electronics. (AT&T/WCom Ex. 12 at 72.) But the presence of spare cable capacity is not a substitute for spare conduit, because spare cable capacity in a failed or flooded duct cannot be used to restore service. The goal is to have a second duct available in which a backup cable can be installed and placed into service. (VZ-VA Ex. 122 at 142.) Nor is the ability to upgrade fiber capacity through additional electronics a substitute for spare conduit. Remote terminal capacity is not infinitely expandable, and SONET ring capacity cannot be upgraded (*e.g.*, from an OC3 ring to an OC12 ring) without taking the ring out of service.[110] (VZ-VA Ex. 122 at 142.)

5. Verizon's Cable And Remote Terminal Sizing Algorithms Produce Lower Per-Unit Costs.

As was repeatedly discussed at the hearing, Verizon VA does not use its utilization factors to size facilities used in its cost studies; it simply applies those factors to the costs of the facilities that are used in the studies. (Tr. at 4210 (Sanford).) While in theory, applying utilization to increase the size of the facility studied would have produced even lower unit costs, ultimately there is no valid concern that cable or remote terminal (RT) sizes used in Verizon VA's studies are understated. To the contrary, Verizon's cable pricing algorithms and its use of a 224-line RT as the smallest size RT are conservative and produce lower per-unit prices.

For distribution cable, Verizon assumed an average cable size in each distribution area equal to the number of working lines in the distribution area. This assumption conservatively overstates cable sizes because distribution cable typically must emerge from the serving area interface (SAI) in multiple directions, requiring multiple cables. (VZ-VA Ex. 122 at 99-100.) In addition, as the distribution cables branch out into the distribution area, they are tapered to

[110] It should be noted, in any event, that AT&T/WorldCom's proposed 64% reduction for Verizon VA's conduit investment does not even follow from their arguments concerning conduit utilization, but instead is the product of arbitrary calculations and adjustments. (*See* VZ-VA Ex. 122 at 143-144 and Attachment L.)

smaller cables. (VZ-VA Ex. 122 at 99-100.) Thus, the average cable size used in a distribution area will be considerably smaller than even the average cable size that emerges from the SAI and certainly smaller than the total number of working lines in the distribution area. Verizon VA's use of total working lines to size distribution cable therefore produced an understatement of forward-looking distribution cable investment.

For copper feeder cable, Verizon assumed a cable size equal to the typical copper feeder cable identified for each UAA in Verizon VA's engineering survey. This typical copper feeder cable size overstates the copper feeder cable size that would be used in the forward-looking TELRIC network, because the feeder cable sizes identified in the engineering survey reflected the then-existing network in which more than 80% of all lines were served using copper feeder. (VZ-VA Ex. 122 at 98.) In the forward-looking network that Verizon VA modeled for the studies, fewer than 18% of all lines would be served with copper feeder. (VZ-VA Ex. 122 at 98.) The significantly smaller number of copper-fed lines in the forward-looking network in turn would require smaller copper feeder cable sizes, but Verizon VA used the larger typical copper feeder cable sizes from its engineering survey. Because the larger sized cable is less expensive on a permit basis, this approach produces an understatement of forward-looking copper feeder cable investment.

When calculating RT investment, Verizon VA assumed a minimum RT size of 224 lines, rather than the smaller ones proposed by Petitioners. Verizon VA's loop cost model used the per-DS0 investment for the 224-line RT, which is *lower* than the per-DS0 investment for smaller RTs. And although Petitioners argue otherwise, this assumption does not decrease utilization in small distribution areas that do not need a 224-line RT; as explained above, utilization rates are *not* generated by the model or its other assumptions, but are average fills drawn from Verizon

VA's operational network. (Tr. at 4253.) The studies thus assume the cost of a 224-RT filled at normal, average utilization. (Tr. at 4467.) Consequently, in Verizon VA's cost model, "the larger the RT, the lower the cost per unit, and actually the lower the cost for the individual loop." (Tr. at 4253 (Sanford).) Thus, Verizon VA's use of 224-line RTs in small distribution areas *understates* UNE loop costs.

B. Interoffice Transport (IOF)

Verizon VA's methodology for calculating the costs of the interoffice transport (IOF) and entrance facilities UNEs assumes the use of a forward-looking, cost-minimizing SONET network configuration that is capable of serving Virginia demand. This approach is consistent with the approach that has been adopted in other state proceedings and reflects reasonable assumptions about IOF in a forward-looking network.

1. Description of the IOF Cost Model

For dedicated transport and entrance facilities,[111/] Verizon VA's IOF cost model uses a capacity costing approach similar to the one used in Verizon VA's loop cost model. The IOF cost model calculates a weighted average capacity cost for providing the transport UNEs over several representative, forward-looking SONET ring configurations. Verizon VA's approach is in contrast to the SONET network simulation approach that AT&T/WorldCom advocate in the MSM, which takes the challenge of being able to model all elements of a network to a new

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111/ The dedicated interoffice transport element consists of transmission facilities that provide dedicated transmission between Verizon VA wire centers for a particular customer. Dedicated transport is offered between Verizon VA facilities at the DS1, DS3, STS-1, OC-3, and OC-12 signaling levels. Entrance facilities are dedicated transmission facilities that connect a CLEC central office or POP to a Verizon VA central office. Verizon VA offers entrance facilities with the same transmission capabilities as interoffice dedicated transport facilities. (VZ-VA Ex. 107 at 213-14.)

extreme. As Mr. Gansert pointed out, "[T]he problem of trying to estimate the cost or trying to build a model of an actual operating interoffice transport network that has several hundred nodes as Virginia does and has hundreds and even thousands of DS3s on a point to point basis, is computationally and practically impossible. No one has ever built such a model that works." (Tr. at 5626.)

Verizon VA's cost model has two components: (1) a fixed cost component that calculates the costs of electronics equipment (*e.g.*, add-drop multiplexers (ADMs) and digital cross-connect systems (DCSs)) at the Verizon wire centers, and (2) a per-mile component that calculates the mileage sensitive costs of the fiber, structure, and intermediate electronics between the wire centers. Verizon VA's fixed costs, which primarily consist of electronic equipment that are located at the nodes, do not vary by the length of the SONET ring. Conversely, per-mile costs by definition vary depending on the distance traveled. (VZ-VA Ex. 107 at 215.)

To develop fixed costs, Verizon VA derived its material investments from its own database or from current contract prices and information from Verizon VA's vendors and engineering organization, and adjusted as appropriate with investment loading factors. A utilization factor was then applied. After these steps were taken, the investments were applied to a number of different circuit designs and weighted according to frequency of use, producing an average circuit investment at the DS0 level. By multiplying the DS0-equivalent for a particular service by this average circuit investment value, Verizon VA calculated the appropriate level of